NEW NAMES FOR BAMBOOS OF NEPAL (POACEAE: BAMBUSOIDEAE)

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ABSTRACT

The use of different generic and species concepts in Sino-Himalayan bamboos is discussed. **Himalayacalamus planatus** Stapleton is separated from *H. asper* Stapleton, both species having now flowered. Two subspecies of *Thamnocalamus spathiflorus* (Trin.) Munro are elevated to species, as **T. nepalensis** (Stapleton) Stapleton and **T. occidentalis** (Stapleton) Stapleton. *Borinda chigar* Stapleton is transferred as **Thamnocalamus chigar** (Stapleton) Stapleton. The synonymy of two species from Nepal with those from neighboring areas is discussed.

RESUMEN

Se discute el uso de diferentes conceptos genéricos y específicos en los bambúes chino-himalayos. **Himalayacalamus planatus** Stapleton se separa de *H. asper* Stapleton, habiendo florecido ahora ambas especies. Dos subespecies de *Thamnocalamus spathiflorus* (Trin.) Munro se elevan a especies, como **T. nepalensis** (Stapleton) Stapleton y **T. occidentalis** (Stapleton) Stapleton. *Borinda chigar* Stapleton se transfiere como **Thamnocalamus chigar** (Stapleton) Stapleton. Se discute la sinonimia de dos especies de Nepal con las áreas próximas.

Many Sino-Himalayan bamboos are of economic or ecological importance in their natural range, but their forest habitats are decreasing and their conservation status is of concern. Several are becoming more widely cultivated in the US and Europe as ornamentals, which has allowed more study of their systematics and identification. The bamboos of Nepal were first enumerated (Hara et al. 1980) according to available literature and earlier, tentative identifications in the national herbarium of Nepal, the British Museum (Natural History), and institutions in Japan, to give a total of 10 species from 5 genera. They were studied further in the 1980s (Stapleton 1982, 1987) and enumerated more comprehensively (Stapleton 1991, 1994a–c), to give a total of 30 species from 11 genera, but 56% of Himalayan bamboo taxa had no name at all at that time, and a substantial number of new names were duly published (Stapleton 1994a–c).

At the same time, Chinese taxonomists were actively collecting and describing Sino-Himalayan bamboos, including those from Tibet, and a revised classification was being developed, with several new genera (Keng 1982–84, 1987), as well as many new species, several collected in Tibet (Yi 1983, 1983a). However, a western generic classification of the grass family was also being produced (Clayton & Renvoize 1986), and that pre-eminent global grass account applied a much broader generic concept to bamboos. Several authorities consequently dismissed many of the new Chinese genera altogether, notably Chao and Renvoize (1989), who relegated *Pleioblastus*, *Oligostachyum*, *Bashania*, *Oreocalamus*, *Chimonocalamus*, *Yushania*, *Drepanostachyum* and *Himalayacalamus* on the grounds that they lead to confusion. Tewari (1993), Li (1997) and Seethalakshmi and Kumar (1998) followed suit. They adopted instead a few, much larger genera, such as *Sinarundinaria* Nakai. Most of the new Chinese genera were recognized by a few others (Soderstrom & Ellis 1988; Majumdar 1989; Stapleton 1987, 1994b–c). This led to two very different approaches to bamboo classification, especially for the subtropical to temperate clade of Asian and North American bamboos.

Along with a narrower generic concept, the new Chinese classification system (Keng 1982–84) also applied a narrower species concept than that used in western grass taxonomy. This utilized many vegetative characteristics, without the emphasis given to floral characters usually applied in more traditionally based treatments (Clayton & Renvoize 1986; Chao & Renvoize 1989). Keng's classification instead followed a different tradition (Munro 1868; Gamble 1896; Camus 1913) of using a narrower species concept in the bamboos than in other grasses, making good use of several characters of the culm sheaths, which are well

differentiated in woody bamboos. Culm sheaths are usually simply referred to as culm leaves in other grasses, where they are very similar to the foliage leaves. In this way Keng's treatment was also to conflict with the much broader bamboo species concept applied by Chao and Renvoize (1989). In that treatment for example, *Drepanostachyum falcatum* was considered to extend from Pakistan to Meghalaya, almost into Bangladesh, and was called *Sinarundinaria falcata*. *Himalayacalamus* was treated essentially as a single species, *Thamnocalamus falconeri*, extending the entire length of the Himalayas.

When Keng's approach to bamboo classification was applied to the species found in Nepal, Sikkim and Bhutan (Majumdar 1989; Stapleton 1994a–c), a large number of new combinations and new taxa were seen to be required. Full use was made of vegetative characters, especially those of culm sheaths and the complex bud and branching characters unique to woody bamboos (Stapleton 1991, 1994a–c). However, because of the broader concepts applied in Clayton and Renvoize (1986) and Chao and Renvoize (1989), some caution was applied in the description of new species without knowledge of floral characteristics, for example in *Himalayacalamus asper* (Stapleton 1994c), in which bamboos with rather different culm sheaths from c & w Nepal were combined. In the few cases where comprehensive floral material was available, a tentative, somewhat broader species concept was applied, for example in *Thamnocalamus spathiflorus*, in which several subspecies and varieties were recognized, rather than distinct species (Stapleton 1994b).

Recent molecular investigations (Ní Chonghaile 2002; Guo et al. 2001, 2002) have shown no support at all for the larger genera, which appear to be polyphyletic. There has also been no support for emphasising floral characters over vegetative ones. The major groupings within the woody bamboos, at supertribal, tribal, or subtribal level, based mainly on differences in floral morphology, were seen to have no support whatsoever from molecular data (Ni Chonghaile 2002). As bamboos have more vegetative characters by which they can differ than other grasses, and there seems no reason why the species concepts applied to other grasses should be forced onto bamboos artificially, it would appear that the recognition of genera and species on the grounds of consistent differences in vegetative characters is now justified. Keng's classification system has gradually become accepted more widely around the world, and its application in the Chinese and English language Flora of China bamboo accounts (Keng & Wang 1996; Li et al. 2006) has increased its credibility. The recent recognition of 3 bamboo species native to the US, rather than 1, separated largely on vegetative characters including branching (Triplett et al. 2006), is further evidence of the trend to recognize smaller taxa with more emphasis on vegetative characters.

In consequence, it would appear that the classification system followed earlier (Majumdar 1989, Stapleton 1994a–c) is acceptable, while that applied elsewhere (Chao & Renvoize 1989; Tewari 1993; Seethalakshmi & Kumar 1998) is unnatural and paraphyletic. Building on this support for the smaller taxa previously established, it is realised that a few alterations are required to the names applied to the bamboos of Nepal (Stapleton 1994a–c). In addition, further collections have since been made within Nepal and adjoining areas, and several species have been introduced into western horticulture, allowing them to become better known, especially as some have recently flowered. Unfortunately, for various reasons, less new botanical fieldwork has been undertaken in Nepal than could have been hoped for, and many gaps in our knowledge still remain. Several additional species have been recorded for Nepal (Poudyal 2006), but most are only tentatively identified and others represent fairly recent introductions. Hopefully the return of peace to that country, and the aspiration of compiling a Flora of Nepal account, will no doubt allow our knowledge of Nepalese bamboos to continue to develop further.

Himalayacalamus was published as a monophyletic genus, but several new species from Nepal were later added, and species described from Tibet and Sikkim in other genera have also been included. In broader generic treatments it was treated as a synonym of *Thamnocalamus* (Clayton & Renvoize 1986; Chao & Renvoize 1989) on the basis of its compressed inflorescences, but *Himalayacalamus* can be distinguished by its usually solitary florets, and by reduced sheaths on inflorescence and culm branches (Stapleton 1994c). Molecular data (Ní Chonghaile 2002) suggests that *Himalayacalamus* is more closely related to *Drepanostachyum*, from which it differs in its fewer branches, adaxially glabrous culm sheaths, and more compressed inflorescences with dense spikelets of fewer, usually solitary florets. The stalk of the spikelet, incorrectly termed a pedicel

in grasses but actually a peduncle, is short in *Himalayacalamus* and *Thamnocalamus*, which has suggested its homology with the vegetative promontory supporting culm branches (Stapleton 1997), hence use of the term promontory as an alternative to pedicel below. *Himalayacalamus* and *Thamnocalamus* have been redescribed to reflect current circumscription and terminology in Stapleton 1994b, 1994c, 2000, and in Li et al. 2006.

Himalayacalamus planatus Stapleton, sp. nov. (**Fig. 1**). TYPE: NEPAL. RASUWA DISTRICT: Syabru (ca. 28°12'N 85°28'E), elev. ca. 8,000 ft, 7 Oct 1984, *Stapleton 328* (HOLOTYPE: K!).

Himalayacalamus asper mihi affinis, sed vaginis culmorum pilosis non asperis, auriculis et setulis oribus vaginorum foliorum absens, nodis culmorum planatis, lemmatibus glabris differt.

Clumps dense. Culms to 2–5 m, 0.5–1.5 cm in diam., nodding to pendulous; internodes to 20 cm, surface with little wax, soon becoming glossy, smooth with no ridges, initially with purple ring above nodes and streaks elsewhere, becoming burgundy-red to brown if exposed, walls to 4 mm thick; nodes level, scarcely raised, sheath scar thin, supranodal ridge absent or slightly raised; mid-culm branches 7–20, central branch to 0.15 cm in diam., aerial roots absent. Culm sheaths quickly deciduous on early shoots, height to ligule ca. 18 cm, similar to internodes in length, attenuating convexly in distal 1/3 to ca. 0.2 cm, basally tough and smooth with membranous recurved margins, distally thinner and shortly hispid, distal 1/3 of both edges densely ca. 0.1 cm white-ciliate; auricles absent; oral setae absent; ligule ca. 0.6 cm wide × 0.3 cm tall, exterior very shortly pubescent, interior glabrous, margin serrate; blade reflexed, to 4 × 0.2 cm, proximally scabrous, deciduous to persistent. Leaf sheath surface and edges glabrous, or overlapping edge distally short-ciliate; auricles absent; oral setae absent; ligule short, to 0.1 cm, rounded, densely puberulous; external ligule not pronounced, glabrous. Leaf blade to 13 × 1 cm, glabrous; petiole glabrous, often pigmented; 2ndary veins 2–3 each side; transverse veins not evident. Synflorescences fasciculated in spicate clusters of racemes. Spikelets on ca. 2–5 mm promontories (pedicels) with 1(–2) florets and a tiny <0.2 mm rudiment on a ca. 4 mm rhachilla extension. Glumes membranous, pale, glabrous, apical ca. 0.7 mm of margins with cilia to ca. 0.2 mm. Fertile lemma 7–9 mm, distally glabrous, not scabrous, green or purple-tinged, apical ca. 0.5 mm with cilia to ca. 0.2 mm. Palea glabrous, keels smooth, apex blunt or very shortly bifid to ca. 0.2 mm with tuft of ca. 0.2 mm hairs. Rhachilla basally to 0.3 mm-lanate along with lemma base, proximally scabrous, distally glabrous.

Distribution and Ecology.—This species is only known from Rasuwa District in Nepal, where it grows in mixed temperate forest. It is also in horticultural cultivation in the UK, France and the US.

Etymology.—The epithet is derived from the level culm nodes, which are scarcely raised and have a thin persistent culm sheath base.

Ethnobotany.—The culms are split and woven into a variety of baskets, trays and mats. Shoots are edible, and leaves are palatable for livestock, but small. Local name is *malinge nigalo* (Nepali). Extensively collected from forest areas.

Additional collections: **NEPAL. Kathmandu Valley:** Chalnakhel (cult.), 22 Jan 1991, *Stapleton* 918 (K). **UNITED KINGDOM. Devon:** Dartmouth, 27 May 1997, *Stapleton* 1120 (K). UK (cult.). **Sussex:** Leigh, 9 Nov 1998, *Pike s.n.* (K).

Two similar bamboo species in the genus *Himalayacalamus*, both lacking the smooth and glabrous culm sheaths normal for that genus were initially collected, without flowers. One was from the Seti Khola valley in Kaski District, w Nepal in 1983, the other from near Syabru in the lower Langtang valley of Rasuwa District, c Nepal in 1984. In the first enumeration of bamboos from Nepal (Stapleton 1991) these were presented as 2 separate species, but in the published account (Stapleton 1994c) they were conservatively combined into one species, *H. asper* Stapleton, the type being the 1983 Kaski collection. Both these bamboos are now in cultivation in the west, and both have now flowered. Better knowledge of their vegetative and floral characteristics, along with a greater degree of confidence in the application of a narrower species concept, requires a new name to be published for the species from the Langtang valley. It was introduced from the Syabru area in 1979 by Merlyn Edwards, and grown at Kew under the misapplied name *Arundinaria microphylla*, then in the US under the name *Neomicrocalamus microphyllus*. After this misidentification was discovered

Fig. 1. *Himalayacalamus planatus* with pilose culm sheath, no leaf sheath auricles or oral setae, level nodes and glabrous racemes of 1-flowered spikelets.

Fig. 2. *Thamnocalamus chigar* showing branch sheathing, flattened branchlet sides, sulcate culm, undifferentiated culm sheath blade and very long leaf sheath ligules.

(Stapleton 1999), it became known in cultivation as *Himalayacalamus asper*, a name that is now unfortunately also misapplied. It has flowered in the UK, as has a plant of the real *Himalayacalamus asper* from Gorapani, Kaski District, collected by Muriel Crouzet, and grown in France. The less bifid palea and shorter apical cilia on glumes, lemma and palea distinguish *H. planatus* from *H. asper*, which, in keeping with its epithet, has minutely scabrous lemmas and apically scabrous palea keels, as well as short, hard, bulbous-based spines on its culm sheaths. A more recent introduction of *H. asper* by Jean Merret, also from Kaski District of w Nepal, has been described as *Drepanostachyum merretii* by Demoly (2006). The seedlings were initially hard to identify, although they were clearly not the same as the cultivated *H. asper*. Now that they have grown larger their true identity, as the only real *H. asper* in cultivation, has been revealed.

Thamnocalamus chigar (Stapleton) Stapleton, comb. nov. *Borinda chigar* Stapleton, Edinburgh J. Bot., 51:286. 1994. TYPE: NEPAL. KASKI DISTRICT: Karuwa to Pipar (ca. 28°24'N 83°58'E), elev. ca. 3,000 m, 16 Nov 1983, *Stapleton 315* (HOLOTYPE: E).

When first collected in 1983, the generic status of this species was very uncertain. As the importance of branching and buds was not appreciated at that time, the material collected did not allow these characters to be properly assessed. New collections of this species with better branching have since been made, and they have revealed that it is not a species of *Borinda* as at first thought. It seems instead to be a rather distinct species of *Thamnocalamus*. Figure 2 shows the sheath scars on the branch complement, which are consistent with *Thamnocalamus* rather than *Borinda* (Stapleton 1994b: Fig. 1, pattern *a* rather than pattern *b*). There is a full complement of broad enclosing sheaths, initiated by a 2-keeled prophyll. In addition, the strong flattening on one side of the branchlets with substantial sulcation on a small culm, further characteristics of *Thamnocalamus*, can clearly be seen (Fig. 2).

The length of the ligules and the long, delicate culm sheaths without a well-distinguished blade are remarkable and obscure the affinity to better-known species of *Thamnocalamus*, which is however revealed in its branch complement structure. Its flowers are still not known. Partially because of the presence of this distinct species, and partially because of consistent vegetative differences between the taxa previously described as subspecies, they are elevated here to species, even though it is very hard to separate them by their flowers alone with any certainty.

Additional collection: **NEPAL. Kaski District:** Modi Khola, Deurali, elev. ca. 3000 m, Nov 1994, *M. Edwards 206* (K).

Thamnocalamus nepalensis (Stapleton) Stapleton, stat. nov. *Thamnocalamus spathiflorus* Munro subsp. *nepalensis* Stapleton, Edinburgh J. Bot. 51:283. 1994.

This subspecies was distinguished from the type by its glabrous culm sheaths and leaf sheaths without oral setae. These characters are now considered to be of importance at the species level, justifying elevation to specific rank.

Thamnocalamus occidentalis (Stapleton) Stapleton, stat. nov. *Thamnocalamus spathiflorus* Munro subsp. *occidentalis* Stapleton, Edinburgh J. Bot. 51:283. 1994.

This subspecies was distinguished from the type by its glabrous but asymmetrical culm sheaths, also with auricles and oral setae. These characters are now considered to be of importance at the species level, justifying elevation to specific rank. This is supported by the geographic disparity between this species, from the nw Himalayas, and *T. spathiflorus* from the e Himalayas. *T. nepalensis*, *T. chigar*, and *T. crassinodus*, all from c Nepal are found between the two species. Although not yet collected there, it is likely to occur in w Nepal.

Bambusa jaintiana R.B. Majumdar

Bambusa alamii Stapleton

Bambusa alamii Stapleton has been considered a synonym of *B. jaintiana* R.B. Majumdar (Alam & Hassan 1994). *B. jaintiana* was minimally diagnosed on the basis of a type collection from the Khasia Hills of Meghalaya. The type has not been seen, but an isoparatype of *B. jaintiana* at K seems identical to *B. tulda*. However, having now visited the Khasia Hills and the type locality for *B. jaintiana*, I am satisfied that a

species growing there is the same as *B. alamii*, and it is assumed that they are synonymous. There is still a possibility, however, that they were introduced from s China or Indochina, where several similar species of 'Weavers' Bamboo' are cultivated.

Himalayacalamus gyirongensis (T.P. Yi) Ohrnberger & **Himalayacalamus porcatus** Stapleton

Fargesia gyirongensis T.P. Yi was described from a collection made in Gyirong Xian, Tibet at 2400 m, which suggests a location possibly less than 10 km north of the Nepalese border at Rasuwa Garhi, and possibly as close as 25 km from the type locality of the later *H. porcatus* Stapleton, from near Syabru at 2300 m. The description of *F. gyirongensis* did not mention porcate culms, and gave the culm sheath as glabrous or setose, the persistent base initially densely setose. The culm sheath of *H. porcatus* is completely glabrous, although the persistent base is lightly tomentose at first. *H. porcatus* also has distinct oral setae on symmetrical culm sheaths, while *F. gyirongensis* was described as having no oral setae, and slightly asymmetrical culm sheaths were illustrated. A suspicion still remains, however, that these two species could be the same, but without inspection of the type specimen of *F. gyirongensis* and fieldwork in Tibet, this cannot be tested properly.

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